



Federal Aviation Administration

Memorandum

Date: November 26, 2010

To: Manager, Transport Standards Staff, International Branch, ANM-116

From: Manager, Transport Standards Staff, Propulsion/Mechanical Systems Branch, ANM-112

Prepared by: Michael Collins, Aerospace Engineer, ANM-112

Subject: INFORMATION: Equivalent Level of Safety Finding for the Alenia Aeronautica Model C-27J FAA Project Number TC0371IB-T

ELOS Memo#: TC0371IB-T-P-10

Regulatory Ref: 14 CFR part 25 subparts E, F, & G.

This memorandum informs the certificate management aircraft certification office of an evaluation made by the Transport Airplane Directorate on the establishment of an equivalent level of safety finding for the Alenia Aeronautica Model C-27J aircraft.

Background

Alenia proposed to adopt the draft part 25 Appendix K requirements, as presented in the attached Draft FAA Notice of Proposed Rulemaking (NPRM) Team Draft, dated April 2001, rather than comply with the current 14 Code of Federal Regulations (CFR) part 25 airworthiness requirements applicable to Auxiliary Power Unit (APU) installations. Alenia's stated objective for applying the draft requirements is to have common certification bases for all major certification authorities. The regulations proposed by the draft NPRM incorporate changes developed through a cooperative effort between the Joint Aviation Authority (JAA), FAA and the Aviation Rulemaking Advisory Committee (ARAC). These changes are intended to achieve common requirements and language between the JAA and FAA, and also make some of the requirements more rational, while maintaining at least the level of safety provided by the current requirements.

Applicable regulation(s)

14 CFR part 25 subparts E, F, & G

The Alenia C27J APU's Revolutions Per Minute (RPM) and Exhaust Gas Temperature (EGT) have digital readouts which are part of the overhead APU control panel located in the flight deck. The readouts consist of a three digit, fixed colors numeric display.

Regulation(s) requiring an ELOS

14 CFR part 25 subpart E, F, & G requirements currently applicable to APU installations.

Description of compensating design features or alternative standards that allow the granting of the ELOS (including design changes, limitations or equipment need for equivalency)

The Transport Aircraft and Engine Issues Group (TAEIG) forwarded to the FAA an ARAC formal recommendation to propose the draft 14 CFR part 25 Appendix K as an NPRM. This recommendation was submitted to the FAA in January of 2000, and the proposed rule changes were collectively categorized as category 1 (enveloped). By definition, an "enveloped," or category 1, rule change accepts the more stringent of the impacted regulations in 14 CFR part 25 and Joint Aviation Requirements (JAR) 25. Although the part 25 APU harmonization effort resulted in consensus between the FAA and industry, there remains one ongoing 14 CFR part 25 subpart E and draft Appendix K/Subpart J significant regulatory difference (§25.901(c)) which is the subject of its own ARAC harmonization effort.

Until resolution is achieved harmonizing the §§25.901(c) and 25.1309 relationships, Appendix K, §K25.901(d), will continue to follow the §25.901(c) "no single failure" requirement and associated accepted means of compliance.

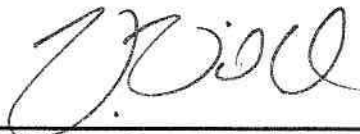
Explanation of how design features or alternative standards provide an equivalent level of safety to the level of safety intended by the regulation

The proposed Appendix K requirements in the draft FAA NPRM, Rulemaking Team Draft, dated April 2001, are harmonized with the proposed JAR 25 subpart J as defined in Notice of Proposed Amendment 25J-300 Issue 0 (November 1998, revised 14 December 2001). These requirements, with §K25.901(d) modified to read the same as the current §25.901(c), inherently represent a more stringent set of APU installation requirements than the relevant regulations within the currently applicable C-27J basis of certification. Alenia has agreed to demonstrate APU installation compliance with the proposed part 25 Appendix K as defined in draft FAA NPRM, Rulemaking Team Draft, dated April 2001, plus the current §25.901(c). This demonstration will ensure an equivalent or possibly increased level of safety compared to compliance with the currently applicable C-27J APU installation regulations.

FAA approval and documentation of the ELOS

The FAA has approved the aforementioned Equivalent Level of Safety Finding as documented in Issue Paper P-10. This memorandum provides standardized documentation of the ELOS that is non-proprietary and can be made available to the public. The Transport Airplane Directorate has assigned a unique ELOS Memorandum number (see front page) to facilitate archiving and retrieval of this ELOS. This ELOS Memorandum number should be listed in the Type Certificate Data Sheet under the Certification Basis section. [e.g., Equivalent Safety Findings have been made for the following regulation(s):

Part 25 subpart E, F, & G requirements applicable to APU installations, Adoption of APU Harmonized Requirements (documented in TAD ELOS Memo TC03711B-T-P-10)]



Manager, Propulsion/Mechanical Systems Branch, ANM-112
Transport Standards Staff

NOVEMBER 26, 2010

Date

ELOS Originated by: Standards Staff, Propulsion Branch	Project Engineer: Michael Collins	Routing Symbol: ANM-112
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[4910-13]

DEPARTMENT OF TRANSPORTATION**Federal Aviation Administration****DRAFT****14 CFR Part 25**

[Docket No. ; Notice No.]

RIN: 2120-

Auxiliary Power Unit (APU) Installation Requirements

AGENCY: Federal Aviation Administration (FAA), DOT.**ACTION:** Notice of proposed rulemaking.

SUMMARY: The FAA proposes an amendment to the airworthiness standards for transport category airplanes to establish a unique part 25 appendix dedicated to the installation requirements for auxiliary power units (APU). This action is prompted by a review of previously certified APU installations, which revealed that, in some cases, part 25 APU certification requirements were not applied consistently to transport category airplanes. Further, the FAA proposes to amend the airworthiness standards for transport category airplanes to harmonize APU installation requirements with those of the European Joint Aviation Requirements (JAR). Adopting this proposal would eliminate regulatory differences between the airworthiness standards of the U.S. and the Joint Aviation Requirements of Europe, without affecting current industry design practices.

DATE: Comments must be received on or before

DATES: Send your comments on or before [Insert date 60 days after date of publication in the Federal Register.]

ADDRESSES:

Address your comments to Dockets Management System, U.S. Department of Transportation Dockets, Room Plaza 401, 400 Seventh Street SW., Washington, DC 20590-0001. You must identify the docket number _____ at the beginning

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of your comments, and you should submit two copies of your comments. If you wish to receive confirmation that the FAA has received your comments, please include a self-addressed, stamped postcard on which the following statement is made: "Comments to Docket No. _____." We will date-stamp the postcard and mail it back to you.

You also may submit comments electronically to the following Internet address:
<http://dms.dot.gov>.

You may review the public docket containing comments to this proposed regulation at the Department of Transportation (DOT) Dockets Office, located on the plaza level of the Nassif Building at the above address. You may review the public docket in person at this address between 9:00 a.m. and 5:00 p.m., Monday through Friday, except Federal holidays. Also, you may review the public dockets on the Internet at <http://dms.dot.gov>.

FOR FURTHER INFORMATION CONTACT: Michael Kaszycki,
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SUPPLEMENTARY INFORMATION:**How Do I Submit Comments to this NPRM?**

Interested persons are invited to participate in the making of the proposed action by submitting such written data, views, or arguments, as they may desire. Comments relating to the environmental, energy, federalism, or economic impact that might result from adopting the proposals in this document are also invited. Substantive comments should be accompanied by cost estimates. Comments must identify the regulatory docket number and be submitted in duplicate to the DOT Rules Docket address specified above.

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All comments received, as well as a report summarizing each substantive public contact with FAA personnel concerning this proposed rulemaking, will be filed in the docket. The docket is available for public inspection before and after the comment closing date.

We will consider all comments received on or before the closing date before taking action on this proposed rulemaking. Comments filed late will be considered as far as possible without incurring expense or delay. The proposals in this document may be changed in light of the comments received.

How Can I Obtain a Copy of this NPRM?

You can get an electronic copy using the Internet by taking the following steps:

- (1) Go to the search function of the Department of Transportation's electronic Docket Management System (DMS) web page (<http://dms.dot.gov/search>).
- (2) On the search page type in the last four digits of the Docket number shown at the beginning of this notice. Click on "search."
- (3) On the next page, which contains the Docket summary information for the Docket you selected, click on the document number of the item you wish to view.

You can also get an electronic copy using the Internet through the Office of Rulemaking's web page at <http://www.faa.gov/avr/armhome.htm> or the Federal Register's web page at http://www.access.gpo.gov/su_docs/aces/aces140.html.

You can also get a copy by submitting a request to the Federal Aviation Administration, Office of Rulemaking, ARM-1, 800 Independence Avenue SW, Washington, DC 20591, or by calling (202) 267-9680. Make sure to identify the docket number, notice number, or amendment number of this rulemaking.

What Are the Relevant Airworthiness Standards in the United States?

In the United States, the airworthiness standards for type certification of transport category airplanes are contained in Title 14, Code of Federal Regulations (CFR) part 25.

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Manufacturers of transport category airplanes must show that each airplane they produce of a different type design complies with the appropriate part 25 standards. These standards apply to:

- airplanes manufactured within the U.S. for use by U.S.-registered operators, and
- airplanes manufactured in other countries and imported to the U.S. under a bilateral airworthiness agreement.

What Are the Relevant Airworthiness Standards in Europe?

In Europe, the airworthiness standards for type certification of transport category airplanes are contained in Joint Aviation Requirements (JAR)-25, which are based on part 25. These were developed by the Joint Aviation Authorities (JAA) of Europe to provide a common set of airworthiness standards within the European aviation community. Twenty-three European countries accept airplanes type certificated to the JAR-25 standards, including airplanes manufactured in the U.S. that are type certificated to JAR-25 standards for export to Europe.

What is "Harmonization" and How Did it Start?

Although part 25 and JAR-25 are very similar, they are not identical in every respect. When airplanes are type certificated to both sets of standards, the differences between part 25 and JAR-25 can result in substantial additional costs to manufacturers and operators. These additional costs, however, frequently do not bring about an increase in safety. In many cases, part 25 and JAR-25 may contain different requirements to accomplish the same safety intent. Consequently, manufacturers are usually burdened with meeting the requirements of both sets of standards, although the level of safety is not increased correspondingly.

Recognizing that a common set of standards would not only benefit the aviation industry economically, but also maintain the necessary high level of safety, the FAA and

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the JAA began an effort in 1988 to “harmonize” their respective aviation standards. The goal of the harmonization effort is to ensure that:

- where possible, standards do not require domestic and foreign parties to manufacture or operate to different standards for each country involved; and
- the standards adopted are mutually acceptable to the FAA and the foreign aviation authorities.

The FAA and JAA have identified a number of significant regulatory differences (SRD) between the wording of part 25 and JAR-25. Both the FAA and the JAA consider “harmonization” of the two sets of standards a high priority.

What is ARAC and What Role Does it Play in Harmonization?

After initiating the first steps towards harmonization, the FAA and JAA soon realized that traditional methods of rulemaking and accommodating different administrative procedures was neither sufficient nor adequate to make appreciable progress towards fulfilling the goal of harmonization. The FAA then identified the Aviation Rulemaking Advisory Committee (ARAC) as an ideal vehicle for assisting in resolving harmonization issues, and, in 1992, the FAA tasked ARAC to undertake the entire harmonization effort.

The FAA had formally established ARAC in 1991 (56 FR 2190, January 22, 1991), to provide advice and recommendations concerning the full range of the FAA’s safety-related rulemaking activity. The FAA sought this advice to develop better rules in less overall time and using fewer FAA resources than previously needed. The committee provides the FAA firsthand information and insight from interested parties regarding potential new rules or revisions of existing rules.

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There are 64 member organizations on the committee, representing a wide range of interests within the aviation community. Meetings of the committee are open to the public, except as authorized by section 10(d) of the Federal Advisory Committee Act.

The ARAC establishes working groups to develop recommendations for resolving specific airworthiness issues. Tasks assigned to working groups are published in the Federal Register. Although working group meetings are not generally open to the public, the FAA solicits participation in working groups from interested members of the public who possess knowledge or experience in the task areas. Working groups report directly to the ARAC, and the ARAC must accept a working group proposal before ARAC presents the proposal to the FAA as an advisory committee recommendation.

The activities of the ARAC will not, however, circumvent the public rulemaking procedures; nor is the FAA limited to the rule language "recommended" by ARAC. If the FAA accepts an ARAC recommendation, the agency proceeds with the normal public rulemaking procedures. Any ARAC participation in a rulemaking package is fully disclosed in the public docket.

What is the Status of the Harmonization Effort Today?

Despite the work that ARAC has undertaken to address harmonization, there remain a large number of regulatory differences between part 25 and JAR-25. The current harmonization process is extremely costly and time-consuming for industry, the FAA, and the JAA. Industry has expressed a strong desire to conclude the harmonization program as quickly as possible to alleviate the drain on their resources and to finally establish one acceptable set of standards.

Recently, representatives of the aviation industry [including Aerospace Industries Association of America, Inc. (AIA), General Aviation Manufacturers Association (GAMA), and European Association of Aerospace Industries (AECMA)] proposed an accelerated process to reach harmonization.

DRAFT**What is the “Fast Track Harmonization Program”?**

In light of a general agreement among the affected industries and authorities to expedite the harmonization program, the FAA and JAA in March 1999 agreed upon a method to achieve these goals. This method, which the FAA has titled “The Fast Track Harmonization Program,” is aimed at expediting the rulemaking process for harmonizing not only the 42 standards that are currently tasked to ARAC for harmonization, but approximately 80 additional standards for part 25 airplanes.

The FAA initiated the Fast Track program on November 26, 1999 (64 FR 66522). This program involves grouping all of the standards needing harmonization into three categories:

Category 1: Envelope – For these standards, parallel part 25 and JAR-25 standards would be compared, and harmonization would be reached by accepting the more stringent of the two standards. Thus, the more stringent requirement of one standard would be “enveloped” into the other standard. In some cases, it may be necessary to incorporate parts of both the part 25 and JAR standard to achieve the final, more stringent standard. (This may necessitate that each authority revises its current standard to incorporate more stringent provisions of the other.)

Category 2: Completed or near complete – For these standards, ARAC has reached, or has nearly reached, technical agreement or consensus on the new wording of the proposed harmonized standards.

Category 3: Harmonize – For these standards, ARAC is not near technical agreement on harmonization, and the parallel part 25 and JAR-25 standards cannot be “enveloped” (as described under Category 1) for reasons of safety or unacceptability. A standard developed under Category 3 would be mutually acceptable to the FAA and JAA, with a consistent means of compliance.

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Further details on the Fast Track Program can be found in the tasking statement (64 FR 66522, November 26, 1999) and the first NPRM published under this program, Fire Protection Requirements for Powerplant Installations on Transport Category Airplanes (65 FR 36978, June 12, 2000).

DISCUSSION OF THE PROPOSAL**How Does This Proposed Regulation Relate to “Fast Track”?**

This proposed regulation results from the recommendations of ARAC submitted under the FAA’s Fast Track Harmonization Program. In this notice, the FAA proposes to amend the portions of part 25 that pertain to APU installations on transport category airplanes. This rulemaking project was categorized as a **Category 2** item under the Fast Track Harmonization Program because the Harmonization Working Group had almost completed its work when the project was re-tasked under Fast Track. However, the actual proposed actions are “enveloping” in nature (that is, the FAA proposes to adopt the more stringent or more up-to-date standards of the current JAR).

What is the Underlying Safety Issue Addressed by the Current Standards?

The installation of an APU is functionally intended to free the airplane from the need for ground-based power and thus permit more flexible aircraft operations.

An APU installation may be designed to supply pneumatic power for aircraft air conditioning (environmental control), main engine starting, and electrical power for operation of aircraft systems while the airplane is on the ground only. This type of APU is classified as non-essential because it is installed as a matter of convenience. It may be non-operational without jeopardizing safe airplane operations.

An APU installation also may be designed to be used during flight to supply electrical and/or pneumatic power to support aircraft system requirements related to redundancy and/or engine in-flight starting. This type of APU installation is classified as essential because it is essential at dispatch of the airplane or for continued safe flight.

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The APU installation and its operation are intended to perform their function(s) without producing an unsafe condition. The current regulations, and those proposed in this notice, are intended to ensure that the functional and specific failure conditions on an APU installation are appropriately addressed by the design.

What are the Current FAA Standards Pertaining to Auxiliary Power Units (APU)?

When part 25 was originally promulgated, APU's were not common in transport category airplanes. Now, however, APU's are widely used in these aircraft. Since the introduction of APU's into transport category commercial aircraft, the FAA has applied the requirements of part 25 pertaining to powerplant (main engine) installation to APU's. It was unclear which of the engine installation requirements applied only to engines and which applied to both engines and APU's.

Subsequent amendments to the part 25 powerplant regulations attempted to specifically address some of the APU requirements. However, the amendments were not always all-encompassing, nor did they always keep current with advances in APU technology. Some of the more recent advances in APU technology include electronic control systems that allow:

- unattended APU operation,
- minimal monitoring of the APU by the flight crew during APU operation during flight, and
- automatic shutdown features to minimize the potential for events that exceed APU parameter limits.

In addition, electronic control of functions that were previously controlled by hydro-mechanical hardware are now commonplace. The interface of the aircraft with the APU control system also has evolved with advances in APU technology.

Where technology has "surpassed" the current regulations, the FAA has found it necessary to issue an increased number of Equivalent Level of Safety findings, in

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accordance with the provisions of § 21.21(b)(1), to applicants who elect to incorporate these new technological features in their designs.

Further, prior to installation on an airplane, most APU's are required to comply with the requirements of Technical Standard Order (TSO) C77a, "Gas Turbine Auxiliary Power Units." When complying with TSO C77a, the APU manufacturer chooses whether to qualify the unit as capable of providing:

- an "essential" function (Category I: the APU is required for the dispatch of the airplane and/or continued safe flight); or
- a "non-essential" function (Category II: the APU is a matter of convenience, either on the ground or in flight, and it may be shut down without jeopardizing safe airplane operation).

Upon installation in an airplane, the APU's function on the airplane is again evaluated during part 25 certification and categorized accordingly. Currently, the part 25 regulations applicable to APU installations do not clearly define or differentiate between an "essential" and a "non-essential" APU installation. This has resulted in inconsistent interpretations of the applicable regulations for each category of APU installation.

What are the Current JAA Standards Pertaining to APU's?

The JAA has clearly defined the European APU installation standards in a separate Subpart J of JAR-25. The JAA standards specifically address APU's only, and segregate the standards applicable only to APU's from those applicable to the main engine installations.

What, If Any, Are the Differences in the Means of Compliance?

There is no significant difference in the means of compliance with either set of standards because, for the most part, the differences in the standards are minimal. Where certain JAR standards are identified as "more stringent" than part 25, the FAA has

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previously approved those standards as means of compliance (Equivalent Level of Safety) for the relevant part 25 section(s).

Both the FAA and JAA have published guidance on complying with various standards applicable to APU's.

What Is the Proposed Action?

The FAA is proposing to revise the portions of part 25 that pertain to APU installations on transport category airplanes. The intent of this proposal is to:

- revise the current part 25 regulations to reflect new existing APU and airplane technological advances;
- clearly define the various APU installation categories and clarify specific regulations applicable to each; and
- minimize the differences between the APU installation requirements of both 14 CFR part 25 and Subpart J of JAR-25.

To address these objectives, the FAA proposes to establish a new appendix K to part 25, where all of the applicable APU installation requirements would be located. The requirements pertaining to specific categories of APU installations would be clarified and addressed separately where appropriate. The remainder of the current part 25 requirements would be revised to eliminate any APU references that would be redundant to the APU requirements contained in the new appendix K.

Where appropriate, this proposal would incorporate the "more stringent" standards of the JAR that concern APU installations. Further, it would harmonize the part 25 standards with those of the JAR, not only in their text and intent, but in their positioning within the standards themselves (i.e., a separate subpart specific to APU installations).

At the same time that the FAA is proposing these changes, the JAA plans to issue a Notice of Proposed Amendment (NPA) to revise Subpart J of JAR-25 to ensure

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harmonization with part 25. The JAA plans to adopt the part 25 standards pertaining to APU's that are "more stringent" than the current JAR's.

Additionally, both the FAA and JAA would adopt the standards that address new technologies related to APU installations.

What are the Proposed Changes to 14 CFR Part 25?

The FAA proposes the following specific changes to the current sections of part 25, subpart E, "Powerplant":

§ 25.901 Installation

1. The term "auxiliary power unit" would be removed from paragraph 25.901(c), as this requirement otherwise would be redundant to the proposed requirement of appendix K [paragraph K25.901(d)].

2. Paragraph 25.901(d) would be revised to require compliance with the APU installation requirements contained in proposed appendix K.

§ 25.903 Engines

1. Paragraph 25.903(d) would be revised to require compliance with the APU installation requirements proposed in appendix K.

2. Paragraph 25.903(f) would be removed, as it otherwise would be redundant to the proposed requirement of appendix K [paragraph K25.903(a)].

§ 25.943 Negative acceleration

The term "auxiliary power unit" would be removed from § 25.943, as this requirement otherwise would be redundant to the proposed requirement of appendix K (paragraph K25.943).

§ 25.951 Fuel System - General

The term "auxiliary power unit" would be removed from paragraph 25.951(a), as this requirement otherwise would be redundant to the proposed requirement of appendix K [paragraph K25.951(a)].

DRAFT§ 25.1041 Cooling - General

The term “auxiliary power unit” would be removed from § 25.1041, as these requirements otherwise would be redundant to the proposed requirement of appendix K (paragraph K25.1041).

§ 25.1091 Induction System - Air Induction

The term “auxiliary power unit” would be removed from paragraphs 25.1091(a), (a)(1), (d), and (d)(1), as these requirements otherwise would be redundant to the proposed requirements of appendix K [paragraphs K25.1091(a), (a)(1), and (a)(3), respectively].

§ 25.1103 Induction system ducts and air duct systems

1. The term “auxiliary power unit” would be removed from paragraphs 25.1103(a), (b)(2), and (d), as these requirements otherwise would be redundant to the proposed requirements of appendix K [paragraphs K25.1103(a), K25.1103(a)(4), and K25.1106(a), respectively].

2. Paragraphs 25.1103(e) and (f) would be removed, as they otherwise would be redundant to the proposed requirements of appendix K [paragraphs K25.1103 (b) and (a)(2), respectively].

§ 25.1121 Exhaust System - General

The term “auxiliary power unit” would be removed from paragraph 25.1121(c), as this requirement otherwise would be redundant to the proposed requirements of appendix K (paragraph K25.1121).

§ 25.1123 Exhaust piping

The term “auxiliary power unit” would be removed from § 25.1123, as these requirements otherwise would be redundant to the proposed requirements of appendix K (paragraph K25.1123).

DRAFT§ 25.1142 Auxiliary power unit controls

Section 25.1142 would be removed, as these requirements otherwise would be redundant to the proposed requirement of appendix K [paragraph K25.1141(a)].

§ 25.1181 Powerplant Fire Protection - Designated fire zones; regions included

Paragraph 25.1181(a)(4) would be removed, as this requirement otherwise would be redundant to the proposed requirement of appendix K [paragraph K25.1181(a)].

§ 25.1189 Shutoff means

The reference to paragraph 25.1189(a)(4) would be removed to be consistent with the proposed change made to paragraph 25.1181(a)(4).

§ 25.1191 Firewalls

The term “auxiliary power unit” would be removed from paragraph 25.1191(a), as this requirement otherwise would be redundant to the proposed requirements of appendix K [paragraph K25.1191(a)].

§ 25.1195 Fire extinguishing systems

The term “auxiliary power unit” would be removed from paragraph 25.1195(b), as this requirement otherwise would be redundant to the proposed requirements of appendix K [paragraph K25.1195(b)].

§ 25.1337 Powerplant instruments

The term “auxiliary power unit” would be removed from paragraphs 25.1337(a)(1) and (a)(3), as APU instrumentation using flammable fluid-filled lines is no longer in use and is considered antiquated.

§ 25.1522 Auxiliary power unit limitations

Section 25.1522 would be removed, as this requirement otherwise would be redundant to the proposed requirement of paragraph K25.1522.

DRAFT§ 25.1549 Powerplant and auxiliary power unit instruments

The term “auxiliary power unit” would be removed from paragraph 25.1549(d), as this requirement otherwise would be redundant to the proposed requirements of appendix K [paragraph K25.1549(d)].

What Requirements Would the Proposed New Appendix K Contain?

The FAA proposes to add a new appendix K to part 25, which would contain all regulations pertinent to APU installations. With this new appendix, the APU is considered to include:

- any engine delivering rotating shaft power, compressed air, or both, which is not intended for direct propulsion of an aircraft;
- each component that affects the control of the APU; and
- each component that affects the safety of the APU and the APU installation.

For the most part, the text of the regulations that would appear in appendix K would be identical to the relevant part 25 regulations that currently apply to both engine and APU installations. The text in appendix K would be reworded, however, to make the regulation specific to APU's only. Additionally, the text and paragraph designation structure would be formatted as necessary for consistency.

Many parts of the proposed appendix K text also would be worded to harmonize it with text appearing in the parallel JAR-25, Subpart J, standards. In most cases, the different wording would be strictly editorial in nature and would neither add to nor reduce the intent or application of the current requirements.

Proposed appendix K would contain definitions of the terms “essential” and “nonessential” functions of the APU, to be consistent with the current TSO C77a qualification levels (discussed previously). Certain regulations that appear in new appendix K would pertain strictly to “essential” APU's.

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Certain sections in proposed appendix K would include aspects that reflect:

- current design and certification practices;
- commonly-used means of compliance (approved by the FAA); or
- FAA generalized policy.

For example, proposed paragraph K25.1189 (“Fuel valves”) would be identical to the current § 25.995, which requires that “each fuel valve must be supported so that no loads resulting from their operation or from accelerated flight conditions are transmitted to the lines attached to the valve.” Proposed paragraph K25.1189, however, would add the following phrase to that requirement:

“... unless adequate strength margins under all loading conditions are provided in the lines and connections.”

This added language represents a means of compliance that the FAA commonly approves (as Equivalent Level of Safety findings) for § 25.995. By adding this language, the FAA is taking proactive steps to incorporate current industry “standards” into the regulations, thereby reducing the number of Equivalent Level of Safety findings (and the commensurate resources expended) that have been required to address this item in the past on a case-by-case basis.

Another example of incorporating “generalized policy” is proposed paragraph K25.1025(b) (“Oil valves”). The text of this proposed paragraph would contain wording identical to the current § 25.1025(c), which currently states:

“(c) Each oil valve must have positive stops or suitable index provisions in the ‘on’ and ‘off’ positions and must be supported so that no loads resulting from its operation or from accelerated flight conditions are transmitted to the lines attached to the valve.”

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However, by adding the following phrase at the end of the current section, proposed paragraph K25.1025(b) would include the FAA's generalized policy relevant to component mounting:

“... unless adequate strength margins under all loading conditions are provided in the lines and connections.”

Other examples where current industry practices have been incorporated into the proposed text include the following paragraphs:

K25.1121 Exhaust system - General

This proposed paragraph would be based on the current § 25.1121, but would be modified to take into account particularities and/or current design of APU systems and certification practices specifically applicable to APU's [i.e., paragraph 25.1121(e) would not be retained in K25.1121 because the design addressed by it (the APU installed in front of the pilot's compartment) is considered obsolete for part 25 aircraft].

K25.1141 APU controls

This proposed paragraph would contain language that takes into account specific APU control design and installation characteristics, as well as currently-applied certification policies (i.e., pertaining to unattended APU operation and remote controls location).

K25.1305 APU instruments - General

This proposed paragraph would contain requirements to reflect the APU indication certification methods currently used for airplanes with APU's employing the “dark cockpit” indication philosophy. The FAA regularly accepts this methodology as an equivalent level of safety to the current § 25.1305 indication requirements. The JAA also regularly accepts this methodology as compliant with the parallel JAR-25 standard.

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Several other paragraphs of proposed appendix K contain text that would be substantially different from that which currently appears in parallel paragraphs in part 25. The reasons for these differences vary, but most would be necessary to:

- harmonize with the parallel JAR,
- add an optional means of compliance, or
- delete references to items that do not apply to, or that are not in use on, APU's.

Described below is each proposed appendix paragraph that would differ from its parallel section. These descriptions refer to the specific proposed text that appears later in this document under "The Proposed Amendment." (**NOTE:** Proposed paragraphs not discussed below are identical to the current parallel section in part 25.)

K25.901 Installation

The definition of "APU installation" would be introduced to replace the current powerplant wording. Additionally, the terms "essential" and "non-essential" functions would be defined to be consistent with current TSO C77a qualification levels.

K25.903 Auxiliary power unit

Text would be provided that relates to starting requirements for both essential and non-essential APU's.

K25.939 APU operating characteristics

Text in the current § 25.939(a) referring specifically to "in-flight" operating characteristics would not be duplicated. This is to ensure that APU installations, certified as ground-operable-only, meet the same requirement.

K25.943 Negative acceleration

The phrase in the current § 25.942 referring to APU's "approved for use in flight" would not be duplicated because the text of the proposed paragraph sufficiently defines the flight condition.

DRAFTK25.951 Fuel system: General

The text of the proposed paragraph would differ from the current § 25.951 text in that references to reciprocating engine requirements would not be duplicated, since they are not applicable to APU's. Current references to "turbine engines" would refer instead to "essential APU's."

K25.953 Fuel system independence

The text of this proposed paragraph would be harmonized with that of the parallel JAR text. Additionally, references to § 25.903(b), which are currently in § 25.953, would not be duplicated in this proposed paragraph. The isolation requirements mentioned are not applicable, as there is typically only one APU installation per airplane.

K25.955 Fuel flow

The text of this proposed paragraph would be harmonized with the parallel requirements of Subpart J of JAR-25. Additionally, references to reciprocating engines that appear in § 25.955 would not be duplicated in the text of this proposed paragraph.

K25.961 Fuel system hot weather operation

The text of this proposed paragraph would be harmonized with the parallel text in Subpart J of JAR-25. The new proposed text would specify that the fuel temperature must be at least 110° F (43° C) "at the start of the climb." The text in the current § 25.955 does not include this qualifier as to when the temperature must be at 110° F (43° C).

K25.977 Fuel tank outlet

This proposed paragraph would be parallel to the current § 25.977 requirements, but would specify that it applies to "essential APU's" and would not include engine-only requirements.

DRAFTK25.991 Fuel pumps

This proposed paragraph would be parallel to the current § 25.991 requirements, but would specify that it applies to “essential APU’s” and would include only the requirements for APU’s.

K25.993 Fuel system lines and fittings

The text of this proposed paragraph would be similar to that in the current § 25.993, which states that flexible connections in fuel lines that may be under pressure and subjected to axial loading must use flexible hose assemblies. The proposed paragraph, however, would also allow compliance by “an equivalent means.” This language is introduced to harmonize this paragraph with its parallel standard in Subpart J of JAR-25.

K25.994 Fuel system components

The text of this proposed paragraph would be parallel to the current § 25.994 except that the term “APU compartment” would be used in place of “nacelle and engine.”

K25.995 Fuel valves

The text of this proposed paragraph would incorporate current FAA policy relevant to APU installations. It would be identical to the requirements of the current § 25.995 except that an additional phrase would be added that states:

“ . . . unless adequate strength margins under all loading conditions are provided in the lines and connections.”

This change is proposed to reflect a common means of compliance that has been approved repeatedly by the FAA. The addition of this phrase to the regulations should reduce the number of Equivalent Level of Safety Findings that the FAA traditionally has issued on this subject.

DRAFTK25.997 Fuel strainer or filter

The text of this proposed paragraph would be parallel to that of § 25.997, except that it would be specific to APU installations. Additionally, text would be added to reflect that the requirements apply only to “essential APU’s.”

K25.1011 Oil system - General

The text of this proposed paragraph would be harmonized with that of the parallel requirements in Subpart J of JAR-25. It would also be parallel to the text of the current § 25.1011, except that all references to “engine” would instead reference “APU,” and requirements specific to reciprocating engines would not be included.

K25.1017 Oil lines and fittings

The text of this proposed paragraph would be identical to the current § 25.1017, except that the phrase “APU air intake” would replace the phrase “engine air induction.” In addition, the current § 25.1017 contains a requirement that the breather discharge not constitute a fire hazard “if foaming occurs or causes emitted oil to strike the pilot windshield.” The proposed text of K25.1017 would not include that phrase, since that requirement has never been applied to an APU installation.

K25.1019 Oil filters

The text of this proposed paragraph would differ from the current § 25.1019 in that it would be specific to APU’s and would reference current FAA policy relevant to APU certification.

K25.1025 Oil valves

As discussed previously, the text of this proposed paragraph would differ from the current § 25.1025 in that requirements applicable only to engines would be excluded, and the FAA’s policy relevant to component mounting would be included.

DRAFTK25.1041 Cooling - General

The text of this proposed paragraph would incorporate the text of the current § 25.1041, but would be APU-specific by excluding references to the main engine. Additionally, the current § 25.1041 requires that the cooling provisions be able to maintain the established temperatures of applicable components and fluids "... under ground, water, and flight operating conditions ...". However, proposed paragraph K25.1041 would delete the requirement relevant to "water" test conditions. The proposed paragraph also would add the qualifying word "critical" before the phrase "... ground and flight operating conditions;" this difference reflects current FAA policy concerning this requirement.

K25.1043 Cooling tests

The text of this proposed paragraph would be essentially the same as the current § 25.1043, but would exclude all requirements that are not applicable for APU installations, and would be consistent with proposed paragraph K25.1041 in the definition of test conditions. Additionally, the proposed paragraph would not specify "100 degrees F" in the requirement to establish a maximum ambient atmospheric temperature corresponding to "sea level conditions of at least 100 degrees F." This difference is consistent with current FAA policy and would harmonize the text with that of the parallel JAR requirements.

K25.1045 Cooling test procedures

The text of this proposed paragraph would be essentially the same as the current § 25.1045, but would exclude all requirements that are not applicable for APU installations, and would be consistent with proposed paragraphs K25.1041 and K25.1043 in the definition of test conditions.

DRAFTK25.1091 Air intake

The text of this proposed paragraph would be essentially the same as the current § 25.1091, but would exclude all requirements that are not applicable for APU installations.

K25.1093 Air intake system icing protection

Paragraph (a) of this proposed paragraph would require that:

“Each non-essential APU air intake system, including any screen if used, which does not comply with paragraph (b) of this section will be restricted to use in non-icing conditions, unless it can be shown that the APU complete with air intake system, if subjected to icing conditions, will not affect the safe operation of the airplane.”

This text would be included to harmonize this requirement with the parallel requirements of Subpart J of JAR-25.

Paragraph (b) of this proposed paragraph would combine the text of the current § 25.1093(b)(1) with the text of parallel JAR requirements [found in JAR 25B1093(b)(2) and 25A1105]. The remaining sections of § 25.1093 would not be included in this proposed paragraph, since they are not applicable to APU installations.

K25.1103 Air intake system ducts

The text of this proposed paragraph would be essentially the same as the current § 25.1103, but would be APU-specific. It should be noted that the requirements defined in the current § 25.1103(d), concerning APU bleed air duct system, would not be included in K25.1103. Instead, they would be included in K25.1106(a) in order to provide one location for all requirements related to APU pneumatic systems.

K25.1106 Bleed air duct systems

This proposed paragraph would consolidate all current requirements concerning the APU bleed air duct system. This same action would be taken by the JAA for the

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relevant JAR requirements. By incorporating this arrangement, both sets of standards would have one section dedicated strictly to APU intake ducts and a separate section dedicated to APU bleed air ducts.

K25.1121 Exhaust system - General

As discussed previously, this proposed paragraph would be similar to the current § 25.1121, but would include only APU installation requirements and current design and certification practices.

K25.1141 APU controls

As discussed previously, this proposed paragraph would be similar to the current § 25.1141. However, it would contain language that takes into account specific APU control design and installation characteristics, as well as currently-applied certification policies (i.e., pertaining to unattended APU operation and remote controls location).

K25.1163 APU accessories

This proposed requirement would be harmonized with parallel JAR requirements (JAR 25B1165), except that K25.1165 would apply to all APU installations, whereas the JAR applies only to essential APU installations.

K25.1181 Designated fire zones

The text of this proposed paragraph would be essentially the same as the current § 25.1181, but would include only requirements specific to APU installations.

K25.1183 Lines, fittings and components

Proposed paragraph K25.1183(c) would contain text concerning fire protection requirements for the components of the APU installation. It would require that all components within a designated fire zone must be fireproof. The proposed paragraph would state:

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“(c) All components, including ducts, within a designated fire zone must be fireproof if, when exposed to or damaged by fire, they could -

(1) Result in fire spreading to other regions of the airplane;

or

(2) Cause unintentional operation of, or inability to operate, essential services or equipment.”

[**NOTE:** This new paragraph parallels a recently-issued rule, amendment 25-101 (65 FR 79706, December 18, 2000) that adds an identical paragraph to § 25.1183.]

K25.1185 Flammable fluids

The text of this proposed paragraph would be similar to that of the current § 25.1185. However, the reference to the “integral oil sump” [appearing in § 25.1182(a)] would be excluded because it is relevant only to reciprocating engines, not APU’s.

K25.1187 Drainage and ventilation of fire zones

The text of this proposed paragraph would be essentially the same as the current § 25.1187, but would include only requirements specific to APU installations.

K25.1189 Shutoff means

As discussed in detail previously, the text of this proposed paragraph would be essentially the same as the current § 25.1189, but would reflect only requirements specific to APU installations, and would include language representing a means of compliance that the FAA commonly approves s Equivalent Level of Safety findings for § 25.995.

K25.1191 Firewalls

The text of this proposed paragraph would be essentially the same as the current § 25.1191, but would include only requirements specific to APU installations.

DRAFTK25.1193 APU compartment

The text of this proposed paragraph would be essentially the same as the current § 25.1193, but would include only requirements specific to APU installations and would be consistent with the text of the parallel standards of Subpart J of JAR-25. Additionally, in paragraph (a) the words “APU compartment” would replace the word “cowling.” The FAA considers this difference necessary because the structure surrounding most APU installations typically is not referred to as “cowling.”

K25.1197 Fire extinguishing agents

The text of proposed paragraph K25.1197(b) would be parallel to the current § 25.1197(b), but would exclude the text concerning “built-in carbon dioxide fuselage compartment fire extinguishing systems.” This text is not included because that type of extinguishing system is not in use on APU’s.

K25.1201 Fire extinguishing system materials

The text of this proposed paragraph would be essentially the same as the current § 25.1201, but would be specific to APU installations.

K25.1203 Fire-detector system

Proposed paragraph K25.1203(g) would differ from the current § 25.1203(g), which states:

“Each fire detector system must be constructed so that when it is in the configuration for installation it will not exceed the alarm activation time approved for the detectors using the response time criteria specified in the appropriate Technical Standard Order for the detector.”

Paragraph K25.1203(g) would contain the added wording “. . . or an acceptable equivalent” after the term “Technical Standard Order.” This additional wording is appropriate since the FAA does not require installed equipment, such as fire detectors, to

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be TSO-approved prior to airplane type certification. Further, the added wording would harmonize this paragraph with the parallel JAR paragraph.

K25.1207 Compliance

This proposed paragraph would be parallel to the current § 25.1207, which states that compliance with the requirements of part 25 dealing with powerplant fire protection (§ 25.1181 through § 25.1203) must be shown either by a full-scale test or by one or more of the following:

- “(a) Tests of similar [installations];
- (b) Tests of components;
- (c) Service experience of aircraft with similar [installations];
- (d) Analysis.”

Proposed paragraph K25.1207 would differ, not only in that it would apply only to APU’s, but also paragraph (d) would state:

- “(d) Analysis, unless tests are specifically required.”

This revision to subparagraph (d) would be made specifically to harmonize the text with the parallel paragraph in Subpart J of JAR-25.

K25.1305 APU instruments - General

As discussed previously, this proposed paragraph would contain requirements to reflect the APU indication certification methods currently used for airplanes with essential and non-essential APU’s employing the “dark cockpit” indication philosophy.

K25.1337 APU instruments - Installation

Although the current § 25.1337 [i.e., paragraphs (a)(1) and (a)(3)] addresses APU requirements with regard to “instruments and instrument lines,” the proposed paragraph K25.1337 would not. These requirements would be omitted from this proposal because current installation practices do not employ this technology. Proposed paragraph

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K25.1337 would contain only requirements relative to the “oil quantity indicator,” parallel to those in the current § 25.1337(d).

K25.1501 Operating limitations and information - General

The text of this proposed paragraph would be essentially the same as the current § 25.1501, but would include only requirements specific to APU installations.

K25.1521 APU limitations

This proposed paragraph would incorporate the intent of the current § 25.1501(a) and § 25.1522 as those sections apply to APU installations. The text of this proposed paragraph would be harmonized with the parallel requirements in Subpart J of JAR-25.

K25.1527 Ambient air temperature and operating altitude

This proposed paragraph would differ from the current § 25.1527, which is titled “Maximum operating altitude.” The current text states:

“The maximum altitude up to which operation is allowed, as limited by flight, structural, powerplant, functional, or equipment characteristics, must be established.”

The text of proposed paragraph K25.1527 would state:

“The extremes of the ambient air temperature and operating altitude for which operation is allowed, as limited by flight, structural, powerplant, functional, or equipment characteristics, must be established.”

This wording would reflect the typical APU operating envelope. It also would harmonize this requirement with the current parallel standard in Subpart J of JAR-25.

K25.1549 Markings and placards - APU instruments

The text of this proposed paragraph would be essentially the same as the current § 25.1549, but would include only requirements specific to APU installations.

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Additionally, the text would be harmonized with the parallel requirement in Subpart J of JAR-25.

K25.1557 Miscellaneous markings and placards

The text of this proposed paragraph would be essentially the same as the current § 25.1557, but would include only requirements specific to APU installations.

How Does This Proposed Standard Address the Underlying Safety Issue?

The proposed standard continues to provide appropriate coverage of all safety concerns related to the APU installation.

What is the Effect of the Proposed Standard Relative to the Current Regulations?

In effect, the proposal would update the regulations and place them all in one designated area so that they are easier to use and to find. It would provide the same level of safety --or slightly higher level -- by including the more stringent standard from either part 25 or JAR-25.

What is the Effect of the Proposed Standard Relative to Current Industry Practice?

The proposed standard maintains the same level of safety because it reflects and codifies current industry practices.

What Other Options Have Been Considered and Why Were They Not Selected?

Within the context of regulatory revisions, the FAA considered one alternative to that proposed: amending each existing part 25 requirement to define clearly which, if any, applied to either “essential” or “non-essential” APU installations.

However, after reviewing the merits associated with the proposed new appendix K, the FAA concluded that an all-inclusive appendix of APU requirements would be much simpler for both applicants and regulators to follow and comply. Further, for harmonization purposes, the proposed new appendix K to part 25 is similar in both context and format to Subpart J of JAR-25, which is already in use by the JAA and its member countries.

DRAFT**Who Would Be Affected by the Proposed Change?**

The proposal would affect airframe and APU manufacturers, as well as installers of APU's for which a supplemental type certificate (STC) has been approved. The actual affect would be minimal, however, since these entities are already complying with both part 25 and the European JAR-25 standards to certificate their products in both the United States and Europe.

Is Existing FAA Advisory Material Adequate?

The FAA considers that the advisory material currently available on APU issues (including various advisory circulars and numerous industry reports) is adequate and that additional advisory material is unnecessary.

What Regulatory Analyses and Assessments Has the FAA Conducted?**Regulatory Evaluation Summary**

Proposed changes to Federal regulations must undergo several economic analyses. First, Executive Order 12866 directs that each Federal agency shall propose or adopt a regulation only upon a reasoned determination that the benefits of the intended regulation justify its costs. Second, the Regulatory Flexibility Act of 1980 requires agencies to analyze the economic effect of regulatory changes on small entities. Third, the Trade Agreements Act (19 U.S.C. section 2531-2533) prohibits agencies from setting standards that create unnecessary obstacles to the foreign commerce of the United States. In developing U.S. standards, this Trade Act also requires the consideration of international standards and, where appropriate, that they be the basis of U.S. standards. And fourth, the Unfunded Mandates Reform Act of 1995 requires agencies to prepare a written assessment of the costs, benefits, and other effects of proposed or final rules that include a Federal mandate likely to result in the expenditure by State, local, or tribal governments, in the aggregate, or by the private sector of \$100 million or more annually (adjusted for inflation).

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In conducting these analyses, the FAA has determined that this proposal has benefits, but no substantial costs, and that it is not “a significant regulatory action” as defined in Executive Order 12866, nor “significant” as defined in DOT’s Regulatory Policies and Procedures. Further, this proposed rule would not have a significant economic impact on a substantial number of small entities, would reduce barriers to international trade, and would not impose an Unfunded Mandate on state, local, or tribal governments, or on the private sector.

The DOT Order 2100.5 prescribes policies and procedures for simplification, analysis, and review of regulations. If it is determined that the expected impact is so minimal that the proposed rule does not warrant a full evaluation, a statement to that effect and the basis for it is included in the proposed regulation. Accordingly, the FAA has determined that the expected impact of this proposed rule is so minimal that the proposed rule does not warrant a full evaluation. The FAA provides the basis for this minimal impact determination below.

Currently, airplane manufacturers must satisfy both part 25 and the European JAR-25 standards to certificate transport category aircraft in both the United States and Europe. Meeting two sets of certification requirements raises the cost of developing a new transport category airplane often with no increase in safety. In the interest of fostering international trade, lowering the cost of aircraft development, and making the certification process more efficient, the FAA, JAA, and aircraft manufacturers have been working to create, to the maximum possible extent, a single set of certification requirements accepted in both the United States and Europe. As explained in detail previously, these efforts are referred to as “harmonization.”

This proposal would update the regulations concerning new APU technology, incorporate the more stringent JAR standards related to APU installations, and relocate all APU-specific standards into one appendix of part 25. This proposed rule results from

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the FAA's acceptance of recommendations made by ARAC. We have concluded that, for the reasons previously discussed in the preamble, the adoption of the proposed requirements in 14 CFR part 25 is the most efficient way to harmonize these sections and, in so doing, the existing level of safety will be preserved.

There was consensus within the ARAC members, comprised of representatives of the affected industry, that the requirements of the proposed rule will not impose additional costs on U.S. manufacturers of part 25 airplanes. We have reviewed the cost analysis provided by industry through the ARAC process. A copy is available through the public docket. Based on this analysis, we consider that a full regulatory evaluation is not necessary.

We invite comments with supporting documentation regarding the regulatory evaluation statements based on ARAC's proposal.

Initial Regulatory Flexibility Determination

The Regulatory Flexibility Act (RFA) of 1980, 50 U.S.C. 601-612, as amended, establishes "as a principle of regulatory issuance that agencies shall endeavor, consistent with the objective of the rule and of applicable statutes, to fit regulatory and informational requirements to the scale of the business, organizations, and governmental jurisdictions subject to regulation." To achieve that principle, the RFA requires agencies to solicit and consider flexible regulatory proposals and to explain the rationale for their actions.

Agencies must perform a review to determine whether a proposed or final rule will have a significant impact on a substantial number of small entities. If the determination is that the rule will, the Agency must prepare a regulatory flexibility analysis as described in the RFA.

However, if an agency determines that a proposed or final rule is not expected to have a significant economic impact on a substantial number of small entities, section

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605(b) of the RFA provides that the head of the agency may so certify and a regulatory flexibility analysis is not required. The certification must include a statement providing the factual basis for this determination, and the reasoning should be clear.

The FAA considers that this proposed rule would not have a significant impact on a substantial number of small entities for two reasons:

First, the net effect of the proposed rule is minimum regulatory cost relief. The proposed rule would require that new transport category aircraft manufacturers meet just one certification requirement, rather than different standards for the United States and Europe. Airplane manufacturers already meet or expect to meet this standard as well as the existing 14 CFR part 25 requirement.

Second, all U.S. transport-aircraft category manufacturers exceed the Small Business Administration small-entity criteria of 1,500 employees for aircraft manufacturers. The current U.S. part 25 airplane manufacturers include: Boeing, Cessna Aircraft, Gulfstream Aerospace, Learjet (owned by Bombardier), Lockheed Martin, McDonnell Douglas (a wholly-owned subsidiary of The Boeing Company), Raytheon Aircraft, and Sabreliner Corporation.

Given that this proposed rule is minimally cost-relieving and that there are no small entity manufacturers of part 25 airplanes, the FAA certifies that this proposed rule would not have a significant impact on a substantial number of small entities.

International Trade Impact Assessment

The Trade Agreement Act of 1979 prohibits Federal agencies from engaging in any standards or related activities that create unnecessary obstacles to the foreign commerce of the United States. Legitimate domestic objectives, such as safety, are not considered unnecessary obstacles. The statute also requires consideration of international standards and, where appropriate, that they be the basis for U.S. standards. In addition, consistent with the Administration's belief in the general superiority and desirability of

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free trade, it is the policy of the Administration to remove or diminish to the extent feasible, barriers to international trade, including both barriers affecting the export of American goods and services to foreign countries and barriers affecting the import of foreign goods and services into the United States.

In accordance with the above statute and policy, the FAA has assessed the potential effect of the proposed rule and has determined that it supports the Administration's free trade policy because this rule would use European international standards as the basis for U.S. standards.

Unfunded Mandates Reform Act

Title II of the Unfunded Mandates Reform Act of 1995 (the Act), codified in 2 U.S.C. 1532-1538, enacted as Public Law 104-4 on March 22, 1995, requires each Federal agency, to the extent permitted by law, to prepare a written assessment of the effects of any Federal mandate in a proposed or final agency rule that may result in the expenditure by State, local, and tribal governments, in the aggregate, or by the private sector, of \$100 million or more (adjusted annually for inflation) in any one year.

This proposed rule does not contain a Federal intergovernmental or private sector mandate that exceeds \$100 million in any year; therefore, the requirements of the Act do not apply.

What Other Assessments Has the FAA Conducted?**Executive Order 13132, Federalism**

The FAA has analyzed this proposed rule and the principles and criteria of Executive Order 13132, Federalism. The FAA has determined that this action would not have a substantial direct effect on the States, on the relationship between the national Government and the States, or on the distribution of power and responsibilities among the various levels of government. Therefore, the FAA has determined that this notice of proposed rulemaking would not have federalism implications.

DRAFT**Paperwork Reduction Act**

The Paperwork Reduction Act of 1995 (44 U.S.C. 3507(d)) requires that the FAA consider the impact of paperwork and other information collection burdens imposed on the public. We have determined that there are no new information collection requirements associated with this proposed rule.

International Compatibility

In keeping with U.S. obligations under the Convention on International Civil Aviation, it is FAA policy to comply with International Civil Aviation Organization (ICAO) Standards and Recommended Practices to the maximum extent practicable. The FAA determined that there are no ICAO Standards and Recommended Practices that correspond to this proposed regulation.

Environmental Analysis

FAA Order 1050.1D defines FAA actions that may be categorically excluded from preparation of a National Environmental Policy Act (NEPA) environmental impact statement. In accordance with FAA Order 1050.1D, appendix 4, paragraph 4(j), this proposed rulemaking action qualifies for a categorical exclusion.

Energy Impact

The energy impact of the proposed rule has been assessed in accordance with the Energy Policy and Conservation Act (EPCA) and Public Law 94-163, as amended (43 U.S.C. 6362), and FAA Order 1053.1. It has been determined that it is not a major regulatory action under the provisions of the EPCA.

Regulations Affecting Intrastate Aviation in Alaska

Section 1205 of the FAA Reauthorization Act of 1996 (110 Stat. 3213) requires the Administrator, when modifying regulations in Title 14 of the CFR in a manner affecting intrastate aviation in Alaska, to consider the extent to which Alaska is not served by transportation modes other than aviation, and to establish such regulatory

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distinctions as he or she considers appropriate. Because this proposed rule would apply to the certification of future designs of transport category airplanes and their subsequent operation, it could, if adopted, affect intrastate aviation in Alaska. The FAA therefore specifically requests comments on whether there is justification for applying the proposed rule differently to intrastate operations in Alaska.

Plain Language

In response to the June 1, 1998, Presidential memorandum regarding the issue of plain language, the FAA re-examined the writing style currently used in the development of regulations. The memorandum requires Federal agencies to communicate clearly with the public. We are interested in your comments on whether the style of this document is clear, and in any other suggestions you might have to improve the clarity of FAA communications that affect you. You can get more information about the Presidential memorandum and the plain language initiative at <http://www.plainlanguage.gov>.

List of Subjects in 14 CFR Part 25

Aircraft, Aviation safety, Reporting and record keeping requirements, Safety, Transportation.

The Proposed Amendment

In consideration of the foregoing, the Federal Aviation Administration proposes to amend part 25 of Title 14, Code of Federal Regulations, as follows:

**PART 25 - AIRWORTHINESS STANDARDS: TRANSPORT CATEGORY
AIRPLANES**

1. The authority citation for Part 25 continues to read as follows:

Authority: 49 U.S.C. 106(g), 40113, 44701, 44702 and 44704

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2. In § 25.901, revise paragraph(d) to read as follows:

§ 25.901 Installation.

* * * * *

(d) Each auxiliary power unit installation must comply with the requirements of Appendix K of this part.

3. In § 25.903, remove paragraph (f).

4. Revise § 25.943 to read as follows:

§ 25.943 Negative acceleration.

No hazardous malfunction of an engine or any component or system associated with the power-plant may occur when the airplane is operated at the negative accelerations within the flight envelopes prescribed in § 25.333. This must be shown for the greatest duration expected for the acceleration.

5. In § 25.951, revise paragraph (a) to read as follows:

§ 25.951 General.

(a) Each fuel system must be constructed and arranged to ensure a flow of fuel at a rate and pressure established for proper engine functioning under each likely operating condition, including any maneuver for which certification is requested and during which the engine is permitted to be in operation.

* * * * *

6. Revise § 25.1041 to read as follows:

§ 25.1041 General.

The powerplant cooling provisions must be able to maintain the temperatures of powerplant components and engine fluids within the temperature limits established for these components and fluids, under ground, water, and flight operating conditions, and after normal engine shutdown.

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7. In § 25.1091, revise paragraphs (a), (a)(1), (d), and (d)(1) to read as follows:

§ 25.1091 Air induction.

(a) The air induction system for each engine must supply--

(1) The air required by that engine under each operating condition for which certification is requested; and

(2) * * *

* * * * *

(d) For turbine engine powered airplanes -

(1) There must be means to prevent hazardous quantities of fuel leakage or overflow from drains, vents, or other components of flammable fluid systems from entering the engine intake system; and

(2) * * *

* * * * *

8. In § 25.1103, revise paragraphs (a), (b), (b)(2), (d), to read as follows; and remove paragraphs (e) and (f):

§25.1103 Induction system ducts and air duct systems.

(a) Each induction system duct upstream of the first stage of the engine supercharger must have a drain to prevent the hazardous accumulation of fuel and moisture in the ground attitude. No drain may discharge where it might cause a fire hazard.

(b) Each induction system duct must be --

(1) * * *

(2) Fire-resistant if it is in any fire zone for which a fire-extinguishing system is required.

* * * * *

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(d) For turbine engine bleed air duct systems, no hazard may result if a duct failure occurs at any point between the air duct source and the airplane unit served by the air.

(e) [Removed]

(f) [Removed]

9. In § 25.1121, revise the introductory text and paragraph (c) to read as follows:

§ 25.1121 General.

For powerplant installations the following apply:

* * * * *

(c) Each component that hot exhaust gases could strike, or that could be subjected to high temperatures from exhaust system parts, must be fireproof. All exhaust system components must be separated by fireproof shields from adjacent parts of the airplane that are outside the engine compartments.

* * * * *

10. In § 25.1123, revise the introductory text and paragraph (a) to read as follows:

§ 25.1123 Exhaust piping.

For powerplant installations, the following apply:

(a) Exhaust piping must be heat and corrosion resistant, and must have provisions to prevent failure due to expansion by operating temperatures.

* * * * *

11. Remove § 25.1142.

12. In § 25.1181, remove paragraph (a)(4).

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13. In § 25.1189, revise paragraph (a) to read as follows:

§ 25.1189 Shutoff means.

(a) Each engine installation and each fire zone specified in § 25.1181(a)(5) must have a means to shut off or otherwise prevent hazardous quantities of fuel, oil, deicer, and other flammable fluids, from flowing into, within, or through any designated fire zone, except that shutoff means are not required for --

* * * * *

14. In § 25.1191, revise paragraph (a) to read as follows:

§ 25.1191 Firewalls.

(a) Each engine, fuel-burning heater, other combustion equipment intended for operation in flight, and the combustion, turbine, and tailpipe sections of turbine engines, must be isolated from the rest of the airplane by firewalls, shrouds, or equivalent means.

* * * * *

15. In § 25.1195, revise paragraph (b) to read as follows:

§ 25.1195 Fire extinguishing systems.

* * * * *

(b) The fire extinguishing system, the quantity of the extinguishing agent, the rate of discharge, and the discharge distribution must be adequate to extinguish fires. It must be shown by either actual or simulated flight tests that under critical airflow conditions in flight the discharge of the extinguishing agent in each designated fire zone specified in paragraph (a) of this section will provide an agent concentration capable of extinguishing fires in that zone and of minimizing the probability of reignition. An individual "one-shot" system maybe used for fuel burning heaters and other combustion equipment. For each other designated fire zone, two discharges must be provided each of which produces adequate agent concentration.

* * * * *

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16. In § 25.13371, revise paragraphs (a)(1) and (a)(3) to read as follows:

§ 25.1337 Powerplant instruments.

(a) Instruments and instrument lines.

(1) Each powerplant instrument line must meet the requirements of §§ 25.993 and 25.1183.

(2) * * *

(3) Each powerplant instrument that utilizes flammable fluids must be installed and located so that the escape of fluid would not create a hazard.

* * * * *

17. Remove § 25.1522.

18. In § 25.1549, revise the introductory text and paragraph (d) to read as follows:

§ 25.1549 Powerplant instruments.

For each required powerplant instrument, as appropriate to the type of instrument-

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(d) Each engine or propeller speed range that is restricted because of excessive vibration stresses must be marked with red arcs or red lines.

19. In part 25, add appendix K to read as follows:

APPENDIX K TO PART 25 - AUXILIARY POWER UNIT INSTALLATIONS

GENERAL

K25.901 Installation.

(a) For the purpose of this appendix , the APU includes:

(1) Any engine delivering rotating shaft power, compressed air, or both, which is not intended for direct propulsion of an aircraft.

(2) Each component that affects the control of the APU.

(3) Each component that affects the safety of the APU and the APU installation.

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(b) For the purpose of this part --

(1) An essential APU is defined as an APU whose function is required for the dispatch of the airplane and/or continued safe flight.

(2) A non-essential APU is defined as an APU whose function is a matter of convenience, either on the ground or in flight, and may be shut down without jeopardizing safe airplane operation.

(c) For each APU --

(1) The installation must comply with:

(i) The installation instructions provided under the TSO; and

(ii) The applicable provisions of this appendix for non-essential APU's; and

(iii) The applicable provisions of this appendix for essential APU's.

(2) The components of the installation must be constructed, arranged, and installed so as to ensure their continued safe operation between normal inspections or overhauls;

(3) The installation must be accessible for necessary inspections and maintenance; and

(4) The major components of the installation must be electrically bonded to the other parts of the airplane.

(d) The APU installation must comply with the requirements of § 25.1309, except that the effects of the following need not comply with § 25.1309(b)

(1) APU case burn through or rupture; and

(2) Uncontained APU rotor failure.

K25.903 Auxiliary Power Unit.

(a) Each APU must meet the appropriate requirements of the TSO for its intended function:

(1) Essential: Category I APU.

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(2) Non-essential: Category I or Category II APU.

(b) [Reserved.]

(c) Control of APU rotation and shutdown capability:

(1) It shall be possible to shut down the APU from the flight deck in normal and emergency conditions.

(2) Where continued rotation of an APU could jeopardize the safety of the airplane, there must be a means for stopping rotation. Each component of the stopping system located in the APU compartment must be at least fire resistant.

(d) For APU Installations:

(1) Design precautions must be taken to minimize the hazards to the airplane in the event of an APU rotor failure or of a fire originating within the APU which burns through the APU casing.

(2) The APU system must be designed and installed to give reasonable assurance that those APU operating limitations that adversely affect rotor structural integrity will not be exceeded in service.

(e) Inflight Start Capability:

(1) For non-essential APU's that can be started inflight and all essential APU's --

(i) A means must be provided to start the APU in flight; and

(ii) An altitude and airspeed envelope must be established and demonstrated for APU inflight starting.

(2) For Essential APU's, cold soak must be considered in establishing the envelope of paragraph (e)(1)(ii) of this section.

K25.939 APU operating characteristics.

(a) APU operating characteristics must be investigated to determine that no adverse characteristics (such as stall, surge, or flame-out) are present, to a hazardous

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degree, during normal and emergency operation within the range of operation limitations of the airplane and of the APU.

(b) [Reserved]

(c) The APU air inlet system may not, as a result of air-flow distortion during normal operation, cause vibration harmful to the APU.

(d) It must be established over the range of operating conditions for which certification is required, that the APU installation vibratory conditions do not exceed the critical frequencies and amplitudes established under the TSO.

K25.943 Negative acceleration.

No hazardous malfunction of an APU or any component or system associated with the APU may occur when the airplane is operated at the negative accelerations within the flight envelopes prescribed in § 25.333. This must be shown for the greatest duration expected for the acceleration.

FUEL SYSTEM

K25.951 General.

(a) Each fuel system must be constructed and arranged to ensure a flow of fuel at a rate and pressure established for proper APU functioning under each likely operating condition, including any maneuver for which certification is requested and during which the APU is permitted to be in operation.

(b) Each fuel system must be arranged so that any air which is introduced into the system will not result in flameout of an essential APU.

(c) Each fuel system for an essential APU must be capable of sustained operation throughout its flow and pressure range with fuel initially saturated with water at 80 °F and having 0.75cc of free water per gallon added and cooled to the most critical condition for icing likely to be encountered in operation.

DRAFTK25.952 Fuel system analysis and test.

(a) Proper fuel system functioning under all probable operating conditions must be shown by analysis and those tests found necessary by the Administrator. Tests, if required, must be made using the airplane fuel system or a test article that reproduces the operating characteristics of the portion of the fuel system to be tested.

(b) The likely failure of any heat exchanger using fuel as one of its fluids may not result in a hazardous condition.

K25.953 Fuel system independence.

Each fuel system must allow the supply of fuel to the APU --

(a) Through a system independent of each part of the system supplying fuel to the main engines; or

(b) From the fuel supply to the main engines if provision is made for a shutoff means to isolate the APU fuel line.

K25.955 Fuel flow.

(a) Each fuel system must provide at least 100 percent of the fuel flow required by the APU under each intended operating condition and maneuver. Compliance must be shown as follows:

(1) Fuel must be delivered at a pressure within the limits specified for the APU.

(2) For essential APU's:

(i) The quantity of fuel in the tank may not exceed the amount established as the unusable fuel supply for that tank under the requirements of § 25.959 plus that necessary to show compliance with this section.

(ii) Each main pump must be used that is necessary for each operating condition and attitude for which compliance with this section is shown, and the appropriate emergency pump must be substituted for each main pump so used.

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(iii) If there is a fuel flowmeter, it must be blocked and the fuel must flow through the meter or its bypass.

(b) If an essential APU can be supplied with fuel from more than one tank, the fuel system must, in addition to having appropriate manual switching capability, be designed to prevent interruption of fuel flow to that APU, without attention by the flight crew, when any tank supplying fuel to that APU is depleted of usable fuel during normal operation, and any other tank, that normally supplies fuel to that APU, contains usable fuel.

K25.961 Fuel system hot weather operation.

For essential APU's:

(a) The fuel supply of an essential APU must perform satisfactorily in hot weather operation. It must be shown that the fuel system from the tank outlet to the APU is pressurized under all intended operations so as to prevent vapor formation. Alternatively, it must be shown that there is no evidence of vapor lock or other malfunctioning during a climb from the altitude of the airport selected by the applicant to the maximum altitude established as an operating limitation under K25.1527, with the APU operating at the most critical conditions for vapor formation but not exceeding the maximum essential load conditions. If the fuel supply is dependent on the same fuel pumps or fuel supply as the main engines, the main engines must be operated at maximum continuous power. The fuel temperature must be at least 110°F (43°C) at the start of the climb.

(b) The test prescribed in paragraph (a) of this section may be performed in flight or on the ground under closely simulated flight conditions. If a flight test is performed in weather cold enough to interfere with the proper conduct of the test, the fuel tank surfaces, fuel lines, and other fuel system parts subject to cold air must be insulated to simulate, insofar as practicable, flight in hot weather.

DRAFTK25.977 Fuel tank outlet.

For essential APU's:

(a) There must be a fuel strainer for the fuel tank outlet or for the booster pump. This strainer must prevent the passage of any object that could restrict fuel flow or damage any fuel system component.

(b) The clear area of each fuel tank outlet strainer must be at least five times the area of the outlet line.

(c) The diameter of each strainer must be at least that of the fuel tank outlet.

(d) Each finger strainer must be accessible for inspection and cleaning.

K25.991 Fuel pumps.

For essential APU's:

(a) Main pumps. Each fuel pump required for proper essential APU operation, or required to meet the fuel system requirements of this section [other than those described in paragraph (b) of this section], is a main pump. For each main pump, provision must be made to allow the bypass of each positive displacement fuel pump other than a fuel pump approved as part of the APU.

(b) Emergency pumps. There must be emergency pumps or another main pump to feed an essential APU immediately after failure of any main pump (other than a fuel pump approved as part of the APU).

K25.993 Fuel system lines and fittings.

(a) Each fuel line must be installed and supported to prevent excessive vibration and to withstand loads due to fuel pressure and accelerated flight conditions.

(b) Each fuel line connected to components of the airplane between which relative motion could exist must have provisions for flexibility.

(c) Each flexible connection in fuel lines that may be under pressure and subjected to axial loading must use flexible hose assemblies or equivalent means.

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(d) Flexible hose must be approved or must be shown to be suitable for the particular application.

(e) No flexible hose that might be adversely affected by exposure to high temperatures may be used where excessive temperatures will exist during operation or after an APU shutdown.

(f) Each fuel line within the fuselage must be designed and installed to allow a reasonable degree of deformation and stretching without leakage.

K25.994 Fuel system components.

Fuel system components in the APU compartment or in the fuselage must be protected from damage which could result in spillage of enough fuel to constitute a fire hazard as a result of a wheels-up landing on a paved runway.

K25.995 Fuel valves.

In addition to the requirements of K25.1189 for shutoff means, each fuel valve must be supported so that no loads resulting from their operation or from accelerated flight conditions are transmitted to the lines attached to the valve, unless adequate strength margins under all loading conditions are provided in the lines and connections.

K25.997 Fuel strainer or filter.

For essential APU's, there must be a fuel strainer or filter between the fuel tank outlet and the inlet of either the fuel metering device or an APU-driven positive displacement pump, whichever is nearer the fuel tank outlet. This fuel strainer or filter must --

(a) Be accessible for draining and cleaning and must incorporate a screen or element which is easily removable;

(b) Have a sediment trap and drain except that it need not have a drain if the strainer or filter is easily removable for drain purposes;

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(c) Be mounted so that its weight is not supported by the connecting lines or by the inlet or outlet connections of the strainer or filter itself, unless adequate strength margins under all loading conditions are provided in the lines and connections; and

(d) Have the capacity (with respect to operating limitations established for the APU) to ensure that APU fuel system functioning is not impaired, with the fuel contaminated to a degree (with respect to particle size and density) that is greater than that established for the APU under the appropriate TSO.

OIL SYSTEMK25.1011 Oil System -- General.

(a) Each APU must have an independent oil system that can supply it with an appropriate quantity of oil at a temperature not above that safe for continuous operation.

(b) The usable oil capacity may not be less than the product of the endurance of the airplane and the approved maximum allowable oil consumption of the APU plus a suitable margin to ensure system circulation.

K25.1017 Oil lines and fittings.

(a) Each oil line must meet the requirements of K25.993 and each oil line and fitting in any designated fire zone must meet the requirements of K25.1183.

(b) Breather lines must be arranged so that --

(1) Condensed water vapor that might freeze and obstruct the line cannot accumulate at any point;

(2) The breather discharge does not constitute a fire hazard; and

(3) The breather does not discharge into the APU air intake system.

K25.1019 Oil filters.

If there is a filter in the APU lubrication system through which all the oil flows, it must be constructed and installed so that oil may flow at an acceptable rate through the

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rest of the system with the filter element completely blocked. An impending filter by-pass indication is required.

K25.1021 Oil system drains.

A drain (or drains) must be provided to allow safe drainage of the oil system.

Each drain must-

- (a) Be accessible, and
- (b) Have manual or automatic means for positive locking in the closed position.

K25.1023 Oil radiators.

Each oil radiator must be able to withstand, without failure, any vibration, inertia, and oil pressure load to which it would be subjected in operation.

K25.1025 Oil valves.

- (a) Each oil shutoff must meet the requirements of K25.1189.
- (b) Each oil valve must have positive stops or suitable index provisions in the "on" and "off" positions and must be supported so that no loads resulting from its operation or from accelerated flight conditions are transmitted to the lines attached to the valve unless adequate strength margins under all loading conditions are provided in the lines and connections.

COOLINGK25.1041 General.

The APU cooling provisions must be able to maintain the temperatures of APU components and fluids within the temperature limits established for these components and fluids, under critical ground and flight operating conditions, and after normal APU shutdown.

K25.1043 Cooling tests.

- (a) General. Compliance with K25.1041 must be shown by tests, under critical conditions. For these tests, the following apply:

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(1) If the tests are conducted under conditions deviating from the maximum ambient atmospheric temperature, the recorded APU temperatures must be corrected under paragraph (c) of this section.

(2) No corrected temperatures determined under paragraph (a)(1) of this section may exceed established limits.

(b) Maximum ambient atmospheric temperature. A maximum ambient atmospheric temperature corresponding to sea level conditions must be established. The temperature lapse rate is 3.6° F (2.0°C) per thousand feet of altitude above sea level until a temperature of -69.7° F (-56.5° C) is reached, above which altitude, the temperature is considered constant at -69.7° F (-56.5° C).

(c) Correction factor. Unless a more rational correction applies, temperatures of APU fluids and components for which temperature limits are established, must be corrected by adding to them the difference between the maximum ambient atmospheric temperature and the temperature of the ambient air at the time of the first occurrence of the maximum component or fluid temperature recorded during the cooling test.

K25.1045 Cooling test procedures.

(a) Compliance with K25.1041 must be shown for the critical conditions that correspond to the applicable performance requirements. The cooling tests must be conducted with the airplane in the configuration, and operating under the conditions that are critical relative to cooling. For the cooling tests, a temperature is 'stabilized' when its rate of change is less than 2° F (1° C) per minute.

(b) Temperatures must be stabilized prior to entry into each critical condition being investigated, unless the entry condition normally is not one during which component and APU fluid temperatures would stabilize (in which case, operation through the full entry condition must be conducted before entry into the critical condition being

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investigated in order to allow temperatures to reach their natural levels at the time of entry).

- (c) Cooling tests for each critical condition must be continued until --
 - (1) The component and APU fluid temperatures stabilize;
 - (2) The stage of flight is completed; or
 - (3) An operating limitation is reached.

AIR INTAKE AND BLEED AIR DUCT SYSTEMS**K25.1091 Air intake.**

The air intake system for the APU --

- (a) Must supply the air required by the APU under each operating condition for which certification is requested;
- (b) May not draw air from within the APU compartment or other compartments unless the inlet is isolated from the APU accessories and power section by a firewall;
- (c) Must have means to prevent hazardous quantities of fuel leakage or overflow from drains, vents, or other components of flammable fluid systems from entering;
- (d) Must be designed to prevent water or slush on the runway, taxiway, or other airport operating surface from being directed into the air intake system in hazardous quantities; and
- (e) Must be located or protected so as to minimize the ingestion of foreign matter during takeoff, landing, and taxiing.

K25.1093 Air intake system icing protection.

- (a) Each non-essential APU air intake system, including any screen if used, which does not comply with paragraph (b) of this section will be restricted to use in non-icing conditions, unless it can be shown that the APU complete with air intake system, if subjected to icing conditions, will not affect the safe operation of the airplane.

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(b) Each essential APU air intake system, including screens if used, must enable the APU to operate over the range of conditions for which certification is required without adverse effect or serious loss of power --

(1) Under the icing conditions specified in Appendix C; and

(2) In falling and blowing snow within the limitations established for the airplane for such operation.

K25.1103 Air intake system ducts.

(a) Each air intake system duct must be --

(1) Drained to prevent accumulation of hazardous quantities of flammable fluid and moisture in the ground attitude. The drain(s) must not discharge in locations that might cause a fire hazard; and

(2) Constructed of materials that will not absorb or trap sufficient quantities of flammable fluids such as to create a fire hazard.

(b) Each duct must be --

(1) Designed to prevent air intake system failures resulting from reverse flow, APU surging, or inlet door closure; and

(2) Fireproof within the APU compartment and for a sufficient distance upstream of the APU compartment to prevent hot gas reverse flow from burning through the APU air intake system ducts and entering any other compartment or area of the airplane in which a hazard would be created resulting from the entry of hot gases.

The materials used to form the remainder of the air intake system duct and plenum chamber of the APU must be capable of resisting the maximum heat conditions likely to occur.

(c) Each duct connected to components between which relative motion could exist must have a means for flexibility.

DRAFTK25.1106 Bleed air duct systems.

- (a) For APU bleed air duct systems, no hazard may result if a duct failure occurs at any point between the air duct source and the airplane unit served by the bleed air.
- (b) Each duct connected to components between which relative motion could exist must have a means for flexibility.
- (c) Where the airflow delivery from the APU and main engine is delivered to a common manifold system, precautions must be taken to minimize the possibility of a hazardous condition due to reverse airflow through the APU resulting from malfunctions of any component in the system.

EXHAUST SYSTEMK25.1121 General.

- (a) Each exhaust system must ensure safe disposal of exhaust gases without fire hazard or carbon monoxide contamination in any personnel compartment. For test purposes, any acceptable carbon monoxide detection method may be used to show the absence of carbon monoxide.
- (b) Each exhaust system part with a surface hot enough to ignite flammable fluids or vapors must be located or shielded so that leakage from any system carrying flammable fluids or vapors will not result in a fire caused by impingement of the fluids or vapors on any part of the exhaust system including shields for the exhaust system.
- (c) Each component that hot exhaust gases could strike, or that could be subjected to high temperatures from exhaust system parts, must be fireproof. All exhaust system components must be separated by fireproof shields from adjacent parts of the airplane that are outside the APU compartment.
- (d) No exhaust gases may discharge so as to cause a fire hazard with respect to any flammable fluid vent or drain.
- (e) [Reserved]

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(f) Each exhaust system component must be ventilated to prevent points of excessively high temperature.

(g) Each exhaust shroud must be ventilated or insulated to avoid, during normal operation, a temperature high enough to ignite any flammable fluids or vapors external to the shroud.

K25.1123 Exhaust piping.

(a) Exhaust piping must be heat and corrosion resistant, and must have provisions to prevent failure due to expansion by operating temperatures.

(b) Piping must be supported to withstand any vibration and inertia loads to which it would be subjected in operation.

(c) Piping connected to components between which relative motion could exist must have means for flexibility.

APU CONTROLS AND ACCESSORIES**K25.1141 APU controls.**

(a) Means must be provided on the flight deck for starting, stopping, and emergency shutdown of each installed APU. Each control must --

(1) Be located, arranged, and designed in accordance with §§ 25.777(a), (b), (c), and (d) and marked in accordance with § 25.1555(a); and

(2) Be designed and located so that it cannot be inadvertently operated by persons entering, leaving, or moving normally in the flight deck; and

(3) Be able to maintain any set position without constant attention by flight crewmembers and without creep due to control loads or vibration; and

(4) Have sufficient strength and rigidity to withstand operating loads without failure and without excessive deflection; and

(5) For flexible controls, be approved or must be shown to be suitable for the particular application.

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(b) APU valve controls located in the flight deck must have --

(1) For manual valves, positive stops or, in the case of fuel valves, suitable index provisions in the open and closed positions;

(2) In the case of valves controlled from the flight deck other than by mechanical means, where the correct functioning of the valve is essential for the safe operation of the airplane, a valve position indicator which senses directly that the valve has attained the position selected must be provided, unless other indications in the flight deck give the flight crew a clear indication that the valve has moved to the selected position. A continuous indicator need not be provided.

(c) For unattended operation, the APU must:

(1) Provide means to automatically shutdown the APU for the following conditions --

(i) Exceedance of any APU parameter limit or existence of a detectable hazardous APU operating condition; and

(ii) Bleed air duct failure between the APU and the airplane unit served by the bleed air, unless it can be shown that no hazard exists to the airplane.

(2) Provide means to automatically shutoff flammable fluids per K25.1189 in case of APU compartment fire.

(d) APU controls located elsewhere on the airplane, which are in addition to the flight deck controls, must meet the following requirements :

(1) Each control must be located so that it cannot be inadvertently operated by persons entering, leaving, or moving normally in the area of the control; and

(2) Each control must be able to maintain any set position without creep due to control loads, vibration, or other external forces resulting from the location.

(e) The portion of each APU control located in a designated fire zone that is required to be operated in the event of a fire must be at least fire resistant.

DRAFTK25.1163 APU accessories.

(a) APU-mounted accessories must be approved for installation on the APU concerned and use the provisions of the APU for mounting.

(b) Electrical equipment subject to arcing or sparking must be installed to minimize the probability of contact with any flammable fluids or vapors that might be present in a free state.

(c) For essential APU's, if continued rotation of a failed aircraft accessory driven by the APU affects the safe operation of the aircraft, there must be means to prevent rotation without interfering with the continued operation of the APU.

K25.1165 APU ignition systems.

Each APU ignition system must be independent of any electrical circuit except those used for assisting, controlling, or analyzing the operation of that system.

APU FIRE PROTECTIONK25.1181 Designated fire zones.

(a) Any APU compartment is a designated fire zone.

(b) Each designated fire zone must meet the requirements of K25.1185 through K25.1203.

K25.1183 Lines, fittings and components.

(a) Except as provided in paragraph (b) of this section, each line, fitting, and other component carrying flammable fluid in any area subject to APU fire conditions, and each component which conveys or contains flammable fluid in a designated fire zone must be fire resistant, except that flammable fluid tanks and supports in a designated fire zone must be fireproof or be enclosed by a fireproof shield unless damage by fire to any non-fireproof part will not cause leakage or spillage of flammable fluid. Components must be shielded or located to safeguard against the ignition of leaking flammable fluid.

(b) Paragraph (a) of this section does not apply to --

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- (1) Lines and fittings already approved as part of an APU, and
- (2) Vent and drain lines, and their fittings, whose failure will not result in, or add to, a fire hazard.
- (c) All components, including ducts, within a designated fire zone must be fireproof if, when exposed to or damaged by fire, they could -
 - (1) Result in fire spreading to other regions of the airplane; or
 - (2) Cause unintentional operation of, or inability to operate, essential services or equipment.

K25.1185 Flammable fluids.

- (a) No tank or reservoir that is a part of a system containing flammable fluids or gases may be in a designated fire zone unless the fluid contained, the design of the system, the materials used in the tank, the shutoff means, and all connections, lines, and controls provide a degree of safety equal to that which would exist if the tank or reservoir were outside such a zone.
- (b) There must be at least one-half inch of clear airspace between each tank or reservoir and each firewall or shroud isolating a designated fire zone.
- (c) Absorbent materials close to flammable fluid system components that might leak must be covered or treated to prevent the absorption of hazardous quantities of fluids.

K25.1187 Drainage and ventilation of fire zones.

- (a) There must be complete drainage of each part of each designated fire zone to minimize the hazards resulting from failure or malfunctioning of any component containing flammable fluids. The drainage means must be --
 - (1) Effective under conditions expected to prevail when drainage is needed; and
 - (2) Arranged so that no discharged fluid will cause an additional fire hazard.

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(b) Each designated fire zone must be ventilated to prevent the accumulation of flammable vapors.

(c) No ventilation opening may be where it would allow the entry of flammable fluids, vapors, or flame from other zones.

(d) Each ventilation means must be arranged so that no discharged vapors will cause an additional fire hazard.

(e) Unless the extinguishing agent capacity and rate of discharge are based on maximum air flow through a zone, there must be means to allow the crew to shutoff sources of forced ventilation to any fire zone.

K25.1189 Shutoff means.

(a) Each APU compartment specified in K25.1181(a) must have a means to shutoff or otherwise prevent hazardous quantities of flammable fluids, from flowing into, within, or through any designated fire zone, except that shutoff means are not required for --

(1) Lines, fittings and components forming an integral part of an APU; and

(2) Oil systems for APU installations in which all external components of the oil system, including the oil tanks, are fireproof.

(b) The closing of any fuel shutoff valve for any APU may not make fuel unavailable to the main engines.

(c) Operation of any shutoff may not interfere with the later emergency operation of other equipment.

(d) Each flammable fluid shutoff means and control must be fireproof or must be located and protected so that any fire in a fire zone will not affect its operation.

(e) No hazardous quantity of flammable fluid may drain into any designated fire zone after shutoff.

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(f) There must be means to guard against inadvertent operation of the shutoff means and to make it possible for the crew to reopen the shutoff means in flight after it has been closed.

(g) Each tank to APU shutoff valve must be located so that the operation of the valve will not be affected by the APU mount structural failure.

(h) Each shutoff valve must have a means to relieve excessive pressure accumulation unless a means for pressure relief is otherwise provided in the system.

K25.1191 Firewalls.

(a) Each APU must be isolated from the rest of the airplane by firewalls, shrouds, or equivalent means.

(b) Each firewall and shroud must be --

(1) Fireproof;

(2) Constructed so that no hazardous quantity of air, fluid, or flame can pass from the compartment to other parts of the airplane;

(3) Constructed so that each opening is sealed with close fitting fireproof grommets, bushings, or firewall fittings; and

(4) Protected against corrosion.

K25.1193 APU Compartment.

(a) Each compartment must be constructed and supported so that it can resist any vibration, inertia, and air load to which it may be subjected in operation.

(b) Each compartment must meet the drainage and ventilation requirements of K25.1187.

(c) [Reserved]

(d) Each part of the compartment subject to high temperatures due to its nearness to exhaust system parts or exhaust gas impingement must be fireproof.

(e) Each airplane must --

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(1) Be designed and constructed so that no fire originating in any APU fire zone can enter, either through openings or by burning through external skin, any other zone or region where it would create additional hazards,

(2) Meet the requirements of paragraph (e)(1) of this section with the landing gear retracted (if applicable), and

(3) Have fireproof skin in areas subject to flame if a fire starts in the APU compartment.

K25.1195 Fire extinguisher systems.

(a) There must be a fire extinguisher system serving the APU compartment.

(b) The fire extinguishing system, the quantity of the extinguishing agent, the rate of discharge, and the discharge distribution must be adequate to extinguish fires. An individual "one shot" system is acceptable.

(c) The fire-extinguishing system for an APU compartment must be able to simultaneously protect each zone of the APU compartment for which protection is provided.

K25.1197 Fire extinguishing agents.

(a) Fire extinguishing agents must --

(1) Be capable of extinguishing flames emanating from any burning of fluids or other combustible materials in the area protected by the fire extinguishing system; and

(2) Have thermal stability over the temperature range likely to be experienced in the compartment in which they are stored.

(b) If any toxic extinguishing agent is used, provisions must be made to prevent harmful concentrations of fluid or fluid vapors (from leakage during normal operation of the airplane or as a result of discharging the fire extinguisher on the ground or in flight) from entering any personnel compartment, even though a defect may exist in the extinguishing system.

DRAFTK25.1199 Extinguishing agent containers.

(a) Each extinguishing agent container must have a pressure relief to prevent bursting of the container by excessive internal pressures.

(b) The discharge end of each discharge line from a pressure relief connection must be located so that discharge of the fire extinguishing agent would not damage the airplane. The line must be located or protected to prevent clogging caused by ice or other foreign matter.

(c) There must be a means for each fire extinguishing agent container to indicate that the container has discharged or that the charging pressure is below the established minimum necessary for proper functioning.

(d) The temperature of each container must be maintained, under intended operating conditions, to prevent the pressure in the container from --

- (1) Falling below that necessary to provide an adequate rate of discharge; or
- (2) Rising high enough to cause premature discharge.

(e) If a pyrotechnic capsule is used to discharge the extinguishing agent, each container must be installed so that temperature conditions will not cause hazardous deterioration of the pyrotechnic capsule.

K25.1201 Fire extinguishing system materials.

(a) No material in any fire extinguishing system may react chemically with any extinguishing agent so as to create a hazard.

(b) Each system component in an APU compartment must be fireproof.

K25.1203 Fire-detector system.

(a) There must be approved, quick acting fire or overheat detectors in each APU compartment in numbers and locations ensuring prompt detection of fire.

(b) Each fire detector system must be constructed and installed so that --

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(1) It will withstand the vibration, inertia, and other loads to which it may be subjected in operation;

(2) There is a means to warn the crew in the event that the sensor or associated wiring within a designated fire zone is severed at one point, unless the system continues to function as a satisfactory detection system after the severing; and

(3) There is a means to warn the crew in the event of a short circuit in the sensor or associated wiring within a designated fire zone, unless the system continues to function as a satisfactory detection system after the short circuit.

(c) No fire or overheat detector may be affected by any oil, water, other fluids, or fumes that might be present.

(d) There must be means to allow the crew to check, in flight, the functioning of each fire or overheat detector electric circuit.

(e) Wiring and other components of each fire or overheat detector system in a fire zone must be at least fire-resistant.

(f) No fire or overheat detector system component for any fire zone may pass through another fire zone, unless --

(1) It is protected against the possibility of false warnings resulting from fires in zones through which it passes; or

(2) Each zone involved is simultaneously protected by the same detector and extinguishing system.

(g) Each fire detector system must be constructed so that when it is in the configuration for installation it will not exceed the alarm activation time approved for the detectors using the response time criteria specified in the appropriate TSO or an acceptable equivalent, for the detector.

DRAFTK25.1207 Compliance.

Unless otherwise specified, compliance with the requirements of K25.1181 through K25.1203 must be shown by a full-scale test or by one or more of the following methods:

- (a) Tests of similar APU installations.
- (b) Tests of components.
- (c) Service experience of aircraft with similar APU installations.
- (d) Analysis, unless tests are specifically required.

EQUIPMENT - GENERALK25.1305 APU instruments.

- (a) The following instruments are required for all APU installations:

- (1) A fire warning indicator.
- (2) An indication that an APU auto-shutdown has occurred.
- (3) Any other instrumentation necessary to assist the flightcrew in -
 - (i) Preventing the exceedance of established APU limits; and
 - (ii) Maintaining continued safe operation of the APU.

(4) Instrumentation in accordance with paragraph (3) of this section need not be provided if automatic features of the APU and its installation provides a degree of safety equal to having the parameters displayed directly.

(b) In addition to the items required by paragraph (a) of this section, the following indicators are required for essential APU installations:

- (1) An indicator to indicate the functioning of the ice protection system, if such a system is installed; and
- (2) An indicator to indicate the proper functioning of any heater used to prevent ice clogging of fuel system components.

DRAFT**INSTRUMENTS - INSTALLATION**K25.1337 APU instruments.

(a) [Reserved]

(b) [Reserved]

(c) [Reserved]

(d) Oil quantity indicator. There must be a stick gauge or equivalent means to indicate the quantity of oil in each tank.

OPERATING LIMITATIONS AND INFORMATIONK25.1501 General.

(a) [Reserved]

(b) The operating limitations and other information necessary for safe operation must be made available to the crewmembers as prescribed in K25.1549, K25.1551, and K25.1583.

OPERATING LIMITATIONSK25.1521 APU limitations.

The APU limitations must be established so that they do not exceed the corresponding approved limits for the APU and its systems. These APU limitations, including categories of operation, must be specified as operating limitations for the airplane.

K25.1527 Ambient air temperature and operating altitude.

The extremes of the ambient air temperature and operating altitude for which operation is allowed, as limited by flight, structural, APU installation, functional, or equipment characteristics, must be established.

DRAFT**MARKINGS AND PLACARDS**K25.1549 APU instruments.

For each APU instrument either a placard or color markings or an acceptable combination must be provided to convey information on the maximum and (where applicable) minimum operating limits. Color coding must comply with the following:

- (a) Each maximum and, if applicable, minimum safe operating limit must be marked with a red radial or a red line;
- (b) Each normal operating range must be marked with a green arc or green line, not extending beyond the maximum and minimum safe limits;
- (c) Each precautionary operating range must be marked with a yellow arc or a yellow line; and
- (d) Each APU speed range that is restricted because of excessive vibration stresses must be marked with red arcs or red lines.

K25.1551 Oil quantity indicator.

Each oil quantity indicator must be marked with enough increments to indicate readily and accurately the quantity of oil.

K25.1557 Miscellaneous markings and placards.

- (a) [Reserved]
- (b) APU fluid filler openings: Oil filler openings must be marked at or near the filler cover with the word "oil."

AIRPLANE FLIGHT MANUALK25.1583 Operating limitations.

APU limitations established under K25.1521 and information to explain the instrument markings provided under K25.1549 and K25.1551 must be furnished.

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